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METEOROLOGY

UDC 531.583:551.57(47+57)

EMPIRICAL EVALUATIONS OF CORRELATION OF GLOBAL WARMING AND COOLING PROCESSES WITH MOISTENING REGIME IN USSR TERRITORY

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA GEOGRAFICHESKAYA in Russian No 5, Sep-Oct 81 (manuscript received 5 Nov 80) pp 86-95

GROYSMAN, P. Ya., State Hydrological Institute

[Abstract] The patterns of variation in the moistening regime in the territory of the USSR were investigated in relation to global warming and cooling processes. This involved an evaluation of the parameters of the linear correlation between precipitation and hemispherical temperature α, equal to $\Delta R \cdot 100\%/R\Delta T$, where ΔR is the deviation of seasonal (annual) sums of precipitation from the norm ($\bar{R}$) with changes in hemispherical temperature by ΔT. In the first approximation the values of these parameters make it possible to judge the scale and sign of changes in atmospheric precipitation with a change in hemispherical temperature. The source of initial data on hemispherical temperature changes during the period 1890-1970 was a time series of mean monthly air surface temperature anomalies in the latitude zone 17.5-87.5°N. The initial data were on deviations of the monthly sums of precipitation from the norm during the observation period 1891-1970. A series of maps (reproduced here) was compiled representing evaluations of the α parameters for seasonal precipitation sums. The maps were prepaed using α evaluations for individual stations. The dimensionality of the α parameters was %/0.1°C. The α evaluations show by what percent from the norm there is a change in the seasonal precipitation sums with an increase in hemispherical temperature by 0.1°C. Since the model is linear, these same evaluations, with the oppostie sign, show by what percent from the norm there is a change in the seasonal sums of precipitation with a decrease in temperature by 0.1°C, and with a change in hemispherical temperature by ΔT°C the change in precipitation is $\alpha\Delta T$% of the norm. It is shown that in general for the European USSR with an increase in hemispherical air temperature the annual precipitation sums decrease. There is a redistribution of precipitation between seasons: in winter and summer its quantity decreases, whereas in the transition seasons it increases somewhat. In many regions the change in global thermal regime is accompanied by changes in the quantity of precipitation falling which are opposite in different seasons. The greatest relative changes in the moistening regime in the USSR occur in the cold season of the

year. It was possible to discriminate regions in which with a change in hemispherical temperature by 0.5°C the changes in winter precipitation exceed 30%. Tables 1 and 2 give some results of evaluation of the linear correlation of spatially averaged precipitation with hemispherical temperature. It is revealed that moisture transport from the Atlantic Ocean into the internal regions of Eurasia is regulated more by the mean meridional temperature gradient: the greater the gradient, the more intense is the westerly transport. It is clear that in the USSR there are regions in which the moistening regime reacts considerably to relatively small changes in mean annual air surface temperature in the northern hemisphere. The data from this study can be used in forecasting impending changes in climate in relation to the anthropogenic increase in the content of atmospheric CO_2. Figures 5, tables 2; references 24: 18 Russian, 6 Western.
[43-5303]

MARINE STUDIES IN FAR EASTERN BIOLOGICAL STUDY AREA

Moscow VECHERNYAYA MOSKVA in Russian 14 Nov 81 p 2

[Unsigned article: "The Sea is Being Studied"]

[Text] An expedition of the Central Scientific Research Institute of Geodesy, Aerial Mapping and Cartography (TsNIIGAiK) has returned to Moscow from the Far East.

One of the directors of the expedition, B. Malakhov, candidate of technical sciences, stated: "Investigations were made in the Far Eastern Marine Biological Study Area of the Institute of Marine Biology, USSR Academy of Sciences, situated in Peter the Great Bay near Vladivostok. The expedition included a team of aqualung divers who investigated the most interesting sectors."

"For the first time a continuous sonar study of the sea floor was made. Apparatus constructed by Moscow specialists and at one time awarded the Gold Medal at the All-Union Exhibition of Achievements in the National Economy, by means of ultrasound made it possible to obtain images of the floor. A strip with a width up to 700 m was surveyed. This apparatus made it possible to discover several sunken ships."

"The expedition studied relief and vegetation on the sea floor, the habitats of fish and marine animals, their migration paths. On the basis of the results of these investigations plans call for the creation of a detailed map of the Far Eastern Marine Biological Study Area."

5303
CSO: 1865/50

NEW RESEARCH SHIP

Moscow IZVESTIYA in Russian 27 Nov 81 p 6

[Article by V. Shmyganovskiy: "The Ocean--Its Elements"]

[Excerpts] At the Okean shipbuilding yard in Nikolayev, the scientific research ship "Akademik Aleksey Krylov" is being prepared for sea trials. This floating laboratory with a displacement of almost 10,000 tons will be the first of a new series of ships designed for comprehensive investigations in the world's oceans.

What is important is not only the number of ships, but their technical and scientific equipment and the excellence of the investigative apparatuses as well. The "Akademik Aleksey Krylov" is equipped with hydrological, chemical, oceanographic, and other laboratories and a powerful computer center. Designers also included a new design of a side hanger for receiving and lowering underwater apparatuses for investigating great depths using a crew of divers.

If one looks at the ship in cross-section as if it were standing at a given point at sea, its above-water part would seem like an iceberg. But its distinctive "root system" is lowered far into the deep: cables with instruments, an apparatus for the taking of water samples and so on. Sailors and scientists can determine its position with great accuracy by using signals from satellites. It will generally be equipped with everything new and up-to-date, for example, the ship automated navigation system "Zaliv", the designers of which won the USSR State Prize for 1981.

The new ship, although the area of its cruise is 10,000 miles, also will have to remain motionless at one place for a long time; the ocean cannot be studied on-the-run. Special devices will guarantee positioning in winds with velocities up to 5 balls.

CSO: 1865/51-P

BRIEFS

NEW INFRARED MARINE DEVICE--The plane flies over the sea, and from a special panel in the on-board laboratory, a meteorologist reads data which designates the water temperature at designated points in the sea. The infrared radiometer, which was created by specialists of the Leningrad Electrotechnical Institute imeni V. I. Ul'yanov (Lenin) in collaboration with oceanographists creates just such a possibility. The remote thermometer which is better than known analogs has significantly smaller dimensions, and what is especially important, it is not affected by vibrations. Hydrologists successfully conducted a temperature survey of the Siberian rivers with it in order to forecast the beginning of ice formation. Cooperatives from Sakhalin used the Leningrad device for locating schools of fish. It also turned out that the device could be used in agriculture. In the Ukraine, for example, it helped to determine the optimum time for conducting field work. The new device according to the authors, has potential also for monitoring several technological processes. [Text] [Moscow VODNYY TRANSPORT in Russian 12 Nov 81 p 3]

CSO: 1865/47-P

UDC 528.72:516

COMPUTING SOME PHOTOGRAMMETRIC ELEMENTS OF APPARATUS FOR UNDERWATER STEREOPHOTOGRAMMETRIC SURVEY

Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: GEODEZIYA I AEROFOTOS"YEMKA in Russian No 4, Jul-Aug 81 (manuscript received 12 Jun 79) pp 94-100

OVECHKIN, V. N., engineer, and FIMIN, R. I., candidate of technical sciences, Moscow Order of Lenin Institute of Geodetic, Aerial Mapping and Cartographic Engineers

[Abstract] In a multimedium photogrammetric survey the optical ray passes through media with different refractive indices, which impairs the central projection laws. The authors examine the problems involved in computing the spatial photogrammetric coordinates of the centers of projection and length of the necessary base, taking into account the conditions of the underwater survey. The following were evaluated: aberrational image distortions; displacement of coordinates of points in the image plane introduced by the plane-parallel lens; influence of construction errors (error in thickness of lens, distance of lens from center of projection, error in length of base) on computation of the spatial coordinates of object points. The materials presented here show that the use of a plane-parallel lens in an underwater stereophotogrammetric survey results in considerable geometrical distortions of the image which increase with an increase in the survey camera angle of view. The distortions can be computed analytically using formulas cited in the article applicable to use of a plane-parallel lens. A formula is also derived for computing the photographic base of the stereophotogrammetric system for an underwater survey, taking into account the hydrooptical and design features of the underwater survey. Figures 1; references 5 Russian.
[27-5303]

UDC 535.813.1:528.7

EVALUATION OF USE OF OPTICAL ELEMENTS IN UNDERWATER SURVEY SYSTEM

Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: GEODEZIYA I AEROFOTOS"YEMKA in Russian No 4, Jul-Aug 81 (manuscript received 2 Feb 81) pp 73-79

LAVROVA, N. P., professor, doctor of technical sciences, and KOLOKOLOV, V. A., graduate student, Moscow Order of Lenin Institute of Geodetic, Aerial Mapping and Cartographic Engineers

[Abstract] One of the problems arising in making preparations for an underwater survey is the creation and analysis of operation of the underwater survey system and its optical elements. This article gives a general method for selecting the optical system for specific types of underwater survey. This method can also be used in determining the requirements imposed on the optical elements. Table 1 gives a listing of different types of optical systems used in an underwater survey (photographic objective with plane-parallel lens; objective with achromatic lens or with achromatic attachment; objective with telescopic attachment; objective with concentric lens and correcting elements; objective with planoconcave lens and correcting elements; special underwater objectives). These optical systems are compared and evaluated on a scale of 1 to 10 using such indices as follows: presence of distortion, chromatism, aberration, field of view, simplicity in design, convenience in use, cost. The different indices are assigned weights. A so-called "matrix of choice" is formed which facilitates proper selection of the system for a specific underwater survey. The method is simple but at the same time makes it possible to take into account a great number of incommensurable indices determining the choice. Tables 10; references 4 Russian.
[27-5303]

UDC 550.834

COMPUTING SEISMIC SHADOW BOUNDARY IN PRESENCE OF NEGATIVE REFRACTION

Leningrad VESTNIK LENINGRADSKOGO UNIVERSITETA: GEOLOGIYA GEOGRAFIYA in Russian No 18, Issue 3, Sep 81 (manuscript received 15 Dec 80) pp 79-81

NEKRASOV, Yu. Ye., Leningrad University

[Abstract] In the interpretation of seismograms registered in seismic work at sea in some cases the problem arises of determining the boundary of the seismic shadow for waves propagating in the water. For computing the position of the boundary ray there are methods requiring the use of rather complex algorithms based on a piecewise-linear or piecewise-parabolic approximation of the velocity profile. Therefore, the author proposes a method for computing the boundary ray based on the mean gradients method (see monograph by N. N. Puzyrev, INTERPRETATSIYA DANNYKH SEYSMORAZVEDKI METODOM OTRAZHENNYKH VOLN

(Interpretation of Seismic Prospecting Data by the Reflected Waves Method), Moscow, 1959). The application of the mean gradients method has made it possible to derive quite simple formulas which are easy to use in computations without an electronic computer. Under sea conditions there is a simple relationship between β, the velocity gradient for a linear law of change in velocity with depth ($V(z) = V_0(1+\beta z)$), and seismic states

$$\bar{V}(z)/V_0 = 1 + \beta z/2, \tag{1}$$

$\bar{V}(z)$ is mean velocity, V_0 is the velocity where the source is situated. This expression can be used as the basis for the proposed computation method. Since the actual distribution of velocity with depth differs appreciably from linear, the concept of a mean gradient $\beta_{mean}(z)$ is introduced. It follows from (1) that $\beta z = 2(\bar{V}/V_0 - 1)$. But by definition $\beta z = V(z) - V_0/V_0$. From these two formulas it is possible to derive an expression for V_0: $V_0 = 2\bar{V} - V(z)$. Thus,

$$\beta(z) = 2(V(z) - \bar{V}(z))/z(2\bar{V}(z) - V(z)). \tag{2}$$

With this as a point of departure and since the ray equation is known for a linear velocity profile, it is possible to derive the necessary formula for computing the shadow zone boundary in the case of negative refraction. Figures 1; references 2 Russian.
[37-5303]

TERRESTRIAL GEOPHYSICS

UDC 528.2/ .5

APPROXIMATION OF RELIEF BY FOURIER SERIES IN SYSTEM OF ORTHOGONAL FUNCTIONS

Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: GEODEZIYA I AEROFOTOS"YEMKA
in Russian No 4, Jul-Aug 81 (manuscript received 30 May 79) pp 19-25

VOVK, I. G., docent, candidate of technical sciences, and KOSTYNA, Yu. G., graduate student, Novosibirsk Institute of Geodetic, Aerial Mapping and Cartographic Engineers

[Abstract] In the description of relief it is possible to use either an analytical or a discrete approximation. The principal shortcoming of a discrete approximation is the need for storing a great volume of initial information. In an analytical approximation the description of relief is accomplished by its representation in the form of some functional relationships relating the vertical and horizontal coordinates. As such relationships it is most common to use systems of linear or nonlinear equations in the form $f(\bar{x}, \bar{Q}) = H(\bar{x})$, where $\bar{x}$ is the vector of horizontal coordinates of the initial points; $\bar{Q}$ is the vector of the sought-for parameters. The dimensionality of the above system is usually great and its solution is difficult even when using modern computers. Moreover, after diagnostic checking of the adequacy of the system of equations for the relief to be approximated there may be a need for its modification and repeated solution. The authors propose that relief be approximated by Fourier series in orthogonal systems of functions. In this case it is not necessary to solve any systems of equations and the employed segment of the series ensures the best mean square approximation. The method outlined here was used in formulating an algorithm and preparing a program for approximating relief in FORTRAN language. Experimental computations were made for six terrain sectors different with respect to area and nature of relief. Two examples are illustrated. Figures 3, tables 1; references 5 Russian.
[27-5303]

UDC 550.837.6

METHOD FOR APPROXIMATE INTERPRETATION OF THREE-LAYER TYPE-H FREQUENCY ELECTROMAGNETIC SOUNDING CURVES ON ELECTRONIC COMPUTER

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI in Russian No 10, Oct 81 (manuscript received 21 Oct 80) pp 114-119

IVANOV, A. P. and FEDOROVA, A. V., Institute of Physics of the Earth imeni O. Yu. Shmidt, USSR Academy of Sciences

[Abstract] The use of microcomputers makes possible a considerable simplification of the problem of interpretation of two-layer frequency electromagnetic sounding curves, as shown by the authors earlier in IZV. AN SSSR: FIZIKA ZEMLI, No 3, p 106, 1981. On the basis of this earlier work, the authors now examine one of the possible methods for interpreting three-layer type-H frequency electromagnetic sounding curves on an electronic computer. In order to solve this problem is it necessary to represent the principal links relating the peculiarities of structure of the curves (such as the values of the coordinates of special points) with the parameters of the geoelectric section, in an analytical form. This is achieved most simply by an analysis of the theoretical frequency electromagnetic sounding curves with a subsequent representation of the results of the analysis of graphs and nomograms. Then the same microcomputer is used in finding approximate analytical expressions for the sought-for dependences by the least squares method and applying the Gauss-Seidel method. This makes it possible to derive equations whose successive solution makes it possible to interpret the curve. The application of the method is illustrated in specific examples. The nature of the errors arising in such interpretation is discussed. The average errors do not exceed 5%; this error can be somewhat reduced when analyzing the results of the interpretation by means of all the formulas cited in this paper. Figures 3; tables 1; references 4 Russian. [46-5303]

UDC 550.837

DIGITAL REGISTRY AND PROCESSING OF RESULTS OF COMPLEX AEROGEOPHYSICAL SURVEY

Leningrad VESTNIK LENINGRAD SKOGO UNIVERSITETA: GEOLOGIYA GEOGRAFIYA in Russian No 18, Issue 3, Sep 81 (manuscript received 18 Dec 80) pp 40-48

LYUBTSEVA, Ye. F., LADATKO, O. N., VESHEV, A. V. and BOGOYAVLENSKIY, A. P., Leningrad University

[Abstract] Aerogeophysical methods are now developing rapidly. An important role in the complex of aerogeophysical methods is played by aerial electrical prospecting, especially by the long cable method, which makes it possible to describe reliably and trace dislocations of different directions and scales, define large blocks and establish the relationship between them, map different

lithological formations, and similar work. A substantial increase in the geological effectiveness of aerogeophysical field work can be achieved by routine correction of the direction of work. The use of an electronic computer greatly reduces data processing time, but there has been a prolonged and time-consuming process of preparing data for computer input. The authors here describe in detail a procedure for registry of observations in a digital code in a form suitable for input into a computer. The All-Union Institute of Mineral Raw Materials has developed the automated "Aeropoisk-2" system for processing the results of gamma spectrometry. The programs for processing the results are described in detail. The program is intended for the use of an in-flight digital registry system on an eight-track punch tape. (Figure 1 gives an example of the coding of the results; Figure 2 illustrates the layout of flight lines in a special coordinate system; Figures 3 and 4 are block diagrams of the first and second parts of the program). The first part of the program is for preparing the initial data for six adjacent flight lines; the second part is for the actual computations. The use of this digitial registry system for gamma spectrometry, airborne magnetometry and aerial electric prospecting by the long cable method in flight on a punch tape which can be introduced into an electronic computer of any type makes it possible to eliminate the time gap between the collection of field data and their processing. The program for processing the results of aerial electrical prospecting by the long cable method is simple and rapid and can be used in processing the results of aerial electrical prospecting by other methods, such as the method of radioelectromagnetic profiling and other aerogeophysical methods after introducing appropriate changes. Figures 4; references 11 Russian.
[37-5303]

UDC 550.834:550.837:534.22

REMOTE DETERMINATION OF CHARACTERISTICS OF LAYERED MEDIA

Novosibirsk GEOLOGIYA I GEOFIZIKA in Russian No 7, Jul 81
(manuscript received 30 Nov 79) pp 81-88

BUKHGEYM, A. L. and ZENKOVA, N. P., Computation Center, Siberian Department, USSR Academy of Sciences, Novosibirsk

[Abstract] Many problems involved in wave propagation in layered media essentially involve solution of the following boundary-value problem:

$$\Delta u + \omega^2/c^2(z)u = f(x,z),\ x = (x_1,\ x_2)\epsilon R^2,\ z\epsilon[o,\ h], \tag{1}$$

$$\ell_0[u] = u + au'_{z|z=0} = 0, \tag{2}$$

$$\ell_h[u] = 0,\ (z = h), \tag{3}$$

where a is some (complex) number, $\ell_h[u]$ is a nonlocal boundary operator unambiguously determined by the complex coefficient of reflection $V(\alpha)$ from

the half-space $z > h$ (α is the angle of incidence of a plane wave), $c(z)$ is the velocity of propagation of disturbances in the layer $z \in [0,h]$. Often the function $c(z)$ and the physical characteristics of the half-space $z > h$, determining the reflection coefficient, are unknown and therefore before solving the direct problem (1)-(3) it is necessary to solve the inverse problem of determining the functions $c(z)$ and $V(\alpha)$ (or one of them, if the other is stipulated), proceeding on the basis of some experimentally measured functionals of the function $u(x,z)$. This article presents one of the possible approaches to solution of this inverse problem. The first step in the solution is a determination of the $c(z)$ function on the basis of kinematic information on the arrival times of waves scattered in stipulated directions. From this point of departure the authors demonstrate that it is possible to reconstruct the velocity section (refraction coefficient) for a medium inhomogeneous in depth and also solve the problem of determining the coefficient of reflection from a layered-inhomogeneous half-space employing some functional of the wave process excited in the medium. Such problems arise in acoustics, seismics and electrical prospecting. The results of numerical experiments are given. Figures 3; references 4 Russian.
[254-5303]

UDC 550.837

COMPUTING IMPEDANCE OF MULTILAYER GEOELECTRIC SECTION IN ARTIFICIAL FIELD FORMATION METHOD

Novosibirsk GEOLOGIYA I GEOFIZIKA In Russian No 7, Jul 81
(manuscript received 30 Nov 79) pp 88-96

FILATIV, V. A. and FILATOVA, V. N., Special Design Bureau of Applied Geophysics, Novosibirsk

[Abstract] During recent years the artificial field formation method has come into wide use in solving certain geological problems related to the search for petroleum and ore deposits. Field work by this method has increased greatly on the Siberian Platform and is expanding with the introduction of improved apparatus. This has made acute the problem of interpreting the results of such measurements. Existing archives of ρ_T and S_T curves are inadequate for interpretation of the multitude of different cases actually observed, especially with an increase in the number of layers in the section. Since most methods for solving the inverse problem in electrical prospecting are based on inversion of the direct problem, the need has arisen for a method for computing ρ_T and s_T curves for a specific section and field-exciting source. Programs already developed for solving this problem involve excessive use of computer time. The authors therefore sought an effective method for computing the electromagnetic field created in the near zone. The problem is formulated as follows. The earth is visualized as a packet of N horizontal homogeneous isotropic layers. The j-th layer has a constant resistivity ρ_j and the thickness h_j. The thickness of the last layer is assumed to be equal to

infinity and the magnetic permeability is assumed to be constant and equal to the permeability of air. It is assumed that along the OX axis on the surface there is a horizontal d-c electric dipole with its center at the origin of coordinates. At the time t = 0 an electric current with the force I is cut into the dipole. Then in the air z > 0 and at the earth's surface z = 0, the electromagnetic field is propagated virtually instantaneously and at this moment in time is not dependent on the structure of the medium. Then begins a process of field redistribution in the lower half-space and it is already dependent on the parameters of the geoelectric section. Therefore, by placing at some point M outside the dipole (such as at the surface) a loop of wire or a grounded wire and registering the electromagnetic field being established as a function of time it becomes possible to study the structure of a stipulated part of the section. A solution is obtained using the integral Laplace transform. Examples of such computations are given. Figures 3; references 13: 12 Russian, 1 Western.
[254-5303]

UDC 550.837

DEEP SOUNDINGS BY ARTIFICIAL FORMATION OF ELECTROMAGNETIC FIELD IN NEAR ZONE IN TRANSBAYKALIA

Novosibirsk GEOLOGIYA I GEOFIZIKA in Russian No 7, Jul 81
(manuscript received 30 Nov 79) pp 98-107

ANTONOV, Yu. N., MOROZOVA, G. M. and MANSHTEYN, A. K., Institute of Geology and Geophysics, Siberian Department, USSR Academy of Sciences, Novosibirsk

[Abstract] The sounding method involving artificial formation of an electromagnetic field in the near zone has now come into extensive use in electrical prospecting. The effective depth of this method is determined by such factors as the means used in the registry of signals, power of sources, shape of excitation current pulses and geoelectric characteristics of section. In the generator complex created at the Institute of Geology and Geophysics there are arrays of storage batteries and a charging unit for replenishing the power. The batteries are recharged during the pauses between the working pulses and in the pauses between signal storage. A block diagram accompanying the text serves as a basis for a detailed discussion of the apparatus. The exact procedures for field work with the apparatus are outlined. The implementation of work of this type in the neighborhood of the Baykal rift is described as an example. The outlined method and described apparatus were highly effective in studying the deep structure of the earth's crust in this area. The method can be improved still more. Since with increasing depth there is not only an increase in the useful signal, but also an exponential attenuation of the short-period variations of the natural field, the placement of the measurement point below the surface would create the most favorable conditions for sounding. Figures 4; references 17: 16 Russian, 1 Western.
[254-5303]

PHYSICS OF ATMOSPHERE

UDC 550.388.2

RADIO EMISSION OF AURORAL IONOSPHERE IN SHF RANGE AND AURORAL OVAL

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 21, No 2, Mar-Apr 81
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[Abstract] The results of observations of radio emission in the auroral ionosphere of the bursts and slowly varying component types in the SHF range ($\lambda = 10.7$ cm) carried out at Noril'sk station in 1976-1977 are presented. Analysis of these data in combination with data on the location of the auroral oval reveals that the sources of radio emission for the most part are localized in the oval. The experimental basis for investigating the mechanisms of generation of ionospheric radio emission in the high and middle latitudes is data on the spectrum of radio emission and its polarization characteristics and information on the correlation of radio emission of different types and the phenomena of magnetospheric substorms. The observations at a frequency of 2805 MHz were made simultaneously with two different antennas: with a width of the directional diagram 60°, oriented at the pole star, and [illegible], oriented to the north at an angle of 10° to the horizon. In the first case there was monitoring of the ionospheric region over the observation point, and in the second, the ionospheric region situated at a distance of several hundred kilometers to the north of the observation point. The ionospheric E region was intersected by the directional diagram at a distance of about 600 km and the F region at a distance of about 1500 mm. A modulation-type radiometer was used as a receiver. The observational data were processes separately for bursts and the slowly varying component. The collected data characterize the dependence of the nighttime maximum of the diurnal variation of activity of radio emission of the auroral ionosphere on the position of the auroral zone. The gradients of the measure of activity of different types of radio emission are greater on the northern boundary of the auroral oval. The data confirm that the sources of such radio emission of the bursts and slowly varying component types are localized at nighttime in the auroral zone. The presence of a daytime maximum, excluding the assumption of a daytime magnetospheric cusp as a source of radiation, can serve as an indication of the possibility of registering radio emission similar to radio emission of the middle-latitude magnetosphere at Noril'sk. Figures 3; references 12: 8 Russian, 4 Western.
[39-5303]

UDC 550.388.2

GEOMAGNETIC EFFECT IN MODULATED HEATING OF IONOSPHERE

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 21, No 2, Mar-Apr 81
(manuscript received 15 Oct 79) pp 352-357

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[Abstract] One of the effects of amplitude-modulated heating of the ionosphere by a powerful radio wave is the generation of low frequency signals at the modulation frequency both in the VLF range ($f \sim 1$ KHz) and in the range of geomagnetic pulsations ($f \sim 1$ Hz). The objective of this study was to derive simple expressions relating the amplitude of artificial pulsations and some integral ionospheric parameters. These expressions are then used in analyzing the geophysical conditions under which the amplitude of the pulsations should be maximum. It was found that for modulation frequencies $\gtrsim 1$ Hz the amplitude of the artificial magnetic pulsations is determined for the most part by the velocity of convection in the ionosphere and the power absorbed at the altitudes of magnetization of electrons ($h \gtrsim 70$ km). With a decrease in the modulation frequency to $\lesssim 10^{-2}$ sec^{-1} the amplitude of the pulsations can increase by 1-2 orders of magnitude. The correlation between amplitude and ionospheric conditions in this case is complicated. The optimum heating regime is one in which the heating wave releases most of its energy in the E layer. The amplitude of the artificial pulsations has virtually no dependence on the directional diagram of the heating apparatus and on the quality of the ionospheric and magnetospheric resonators. Some intensification of the surface magnetic effect occurs with an increase in the ratio of the integral Hall and Pedersen conductivities, as can occur in the sporadic E layer. References 12: 8 Russian, 4 Western.
[39-5303]

UDC 550.388.2

EFFECT OF MAIN IONIZATION GAP ON PROPAGATION OF DECAMETER RADIO WAVES IN HIGH LATITUDES

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 21, No 2, Mar-Apr 81
(manuscript received 16 Apr 80) pp 289-297

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[Abstract] The article gives an analysis of the results of slant sounding of the ionosphere (variations of the maximum observable frequencies, propagation modes, etc.) and also a detailed study of the dynamic statistical characteristics of short-wave signals on high-latitude paths when they are situated in

the zone of the main ionization gap and with reflection from the northern boundary of the gap. Also examined are the possibilities of both the method for automatic slant sounding of the ionosphere and observations of the characteristics of signals for determining the position and dynamics of the polar edge of the gap. The investigations were made on five high-latitude paths differently oriented relative to the auroral zone and having a common receiving center at $\Phi' \approx 64°$. The regions of radio path reflection were situated in the range of invariant latitudes $\Phi' = 61\text{-}70°$. Radiopath No 1 with an extent of 2800 km had a southwesterly direction relative to the reception point. Its reflection region was situated at $\Phi' \approx 62°$. Path No 2 with a length of 1500 km with a reflection region at $\Phi' \approx 70°$ was directed to the northwest of the reception point. These radiopaths were outfitted with apparatus for slant sounding of the ionosphere at a moving frequency with a frequency range 3.5-27.5 MHz. Slant sounding data for the period from October 1977 through March 1978 are analyzed. The data reveal the presence of stable behavior in the transmission of frequencies and the characteristics of signals when radiopaths are in the gap zone. Observations of variations of signal characteristics at fixed frequencies and the slant sounding method with a moving frequency reveal the possibility of determining the position and dynamics of the polar wall of the gap. The results can be used in predicting the conditions for radio wave propagation and the planning of work for short-wave radio links. Figures 4; references 11: 7 Russian, 4 Western.
[39-5303]

UDC 550.388.2

PERIODIC STRUCTURES IN POLAR IONOSPHERE AND GEOMAGNETIC VARIATIONS

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 21, No 2, Mar-Apr 81 (manuscript received 10 Aug 79, after revision 18 Jan 80) pp 272-277

AL'PEROVICH, L. S. and GERSHENZON, N. I., Institute of Physics of the Earth, USSR Academy of Sciences

[Abstract] The study of geomagnetic variations in the high-latitude region has revealed that this region is characterized by the excitation of long-period pulsations of the Pi3 type whose origin is usually associated with oscillations of magnetospheric-ionospheric current systems. Since the movement of ionospheric gas perpendicular to the earth's magnetic field leads to the appearance of electric currents and fields which can be a source of geomagnetic variations, the authors investigated periodic structures in the ionosphere for discriminating intraionospheric sources of geomagnetic variations. The polar ionosphere was selected for this investigation. Longitudinal electric currents and the leakage of high-energy particles create inhomogeneities of temperature and composition, which causes the movement of ionospheric gas and the development of different hydrodynamic instabilities. A system of equations of hydrodynamics of a binary mixture is investigated analytically for the purpose of obtaining a criterion of the development of oscillatory instability. The critical gradients of temperature and concentration are determined. The determined

velocities of the ionospheric gas are used in estimating the amplitudes of the geomagnetic variations caused by such macroscopic movements. Shortened formulas are derived for the horizontal temperature gradient, wavelength along the y-axis and period of oscillations; for altitudes 110-150 km these parameters vary in the ranges 0.06-0.8°/km, 350-250 km and 70-35 minutes respectively. In the region of the polar electrojet the critical temperature gradient is easily exceeded at the time of moderate and strong disturbances. As a result, periodic structures can be formed along the electrojet and the advective flow will transport them in a meridional direction. The amplitudes of the u, v, w velocities in the examined system are related to one another approximately as 15:10:1. Estimates show that with exceeding of the critical temperature gradient by 20% the amplitude of the velocity along the x-axis can attain 100 m/sec. The oscillations which develop under these circumstances can be a source of singular geomagnetic pulsations of the Ps6 type, a distinguishing characteristic of which should be their local nature. References 15: 5 Russian, 10 Western.
[39-5303]

UDC 550.388.2

MODEL OF DISTURBANCES OF UPPER IONOSPHERE BY POWERFUL RADIO WAVES

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 21, No 2, Mar-Apr 81
(manuscript received 2 Jan 80) pp 233-238

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[Abstract] Vertical sounding of the ionosphere by powerful radio waves in the SW range leads to the development of an extremely wide range of geo- and radiophysical phenomena related to nonlinear effects in circumterrestrial plasma. This article is devoted to numerical investigation of the processes of disturbance of plasma temperature and concentration in the F region associated with general heating of the upper ionosphere. On the basis of numerical solution of a system of equations describing the state of ionospheric and magnetospheric plasma a model is formulated which describes disturbances in concentrations and temperature arising during heating of the F region by powerful SW radiation. The model is computed in a nonstationary variant. The results of the computations are represented for different geophysical conditions and in dependence on the potentials of the heating transmitters. The following conclusions can be drawn concerning the nature of the inhomogeneities arising during heating of the F region by powerful radio waves: 1) drift movement limits the duration of effective heating of plasma to a time $\lesssim$ 1 hour; 2) modern apparatus can ensure an increase in electron temperature by ~100%; 3) changes in electron concentration directly in the heating region are negative and constitute a few or tens of percent. Above and below the zones of heating the N_e disturbances are positive and small in magnitude; 4) the vertical extent of inhomogeneities of concentration and

temperature is hundreds of kilometers; 5) the horizontal extent of inhomogeneities is $\lesssim$ 100 km; 6) the greatest effectiveness is achieved with approximation of the frequency of the heating radiation to the critical frequency of the F2 layer and occurs under nighttime conditions. Figures 4; references 14: 11 Russian, 3 Western.
[39-5303]

UDC 528.021.7

EFFECT OF DISPERSIONAL DISTORTION OF ATMOSPHERIC SIGNAL ON PHASE MEASUREMENTS IN LASER RANGEFINDER

Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: GEODEZIYA I AEROFOTOS"YEMKA in Russian No 4, Jul-Aug 81 (manuscript received 18 Mar 80) pp 3-7

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[Abstract] The presence of light dispersion in the atmosphere, distorting the shape of a signal having a modulation spectrum, should exert an influence on the results of phase measurements. It can be postulated that this influence is small, but an effort has been made to obtain quantitative estimates. In an analysis of dispersion distortion of a signal in the dispersion expression $\omega = \omega(k)$ relating the frequency ω and the wave number k (or in the inverse relationship $k = k(\omega)$) it is necessary to take into account a second-order term since without allowance for this term the signal is propagated without distortions with the group velocity $v_{gr} = d\omega/dk$. The problem of dispersion distortion of signals was investigated in detail in a book by M. A. Kolosov, et al. entitled RASPROSTRANENIYE RADIOVOLN PRI KOSMICHESKOY SVYAZI (Radio Wave Propagation in Space Communication), Moscow, "Svyaz'," 1969, and the results presented there are used as a point of departure for this study. As a simplification the analysis is limited to the case of an ideally harmonic amplitude modulation of laser radiation, not taking into account the influence of the aharmonicity of the law of change in the intensity of light at the output of a real modulator. The materials presented here show that the phase error caused by the dispersion properties of the atmosphere for a rangefinder with a helium-neon laser is only 3" even with f = 10 GHz for a path with a length 50 km; at lower frequencies and with shorter paths it will be still less. Accordingly, it can be completely neglected. References 4: 3 Russian, 1 Western.
[27-5303]

NEW CONCLUSIONS CONCERNING SOLAR PHENOMENA

Riga SOVETSKAYA LATVIYA in Russian 1 Nov 81 p 4

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[Abstract] In November 1979 astronomers at the Ussuriysk Solar Service Station observed the maximum of the current cylce of solar activity. During the last 370 years such a high solar activity has been observed three times: 1778, 1947, 1957. It appears that the secular variations of solar activity have double maxima. Taking the behavior of this phenomenon into account it is possible to make a super-long-range forecast of solar activity for 100 years in advance. According to the forecast, in the next three decades there will be a decrease in solar activity, but not as deep as early in the 20th century. On the other hand, in the mid-21st century there will be an occurrence of powerful solar activity. Since the maximum of 1979 solar activity has been gradually decreasing; the next minimum is expected in 1986. On the basis of observations made at the station it has been established that the monthly fluctuations of spot activity in the northern and southern parts of the solar disk develop in two regimes: parallel and antiparallel. A change in the rhythm of these fluctuations occurs in the years of the maxima. During the period from mid-1976 through May 1979 the monthly fluctuations of spot activity in the north and south developed parallely and then antiparallely. Solar flares are controlled by an entirely different mechanism. During the 11-year cycle No 20 (1964-1976) the monthly fluctuations of flare activity in the north and south were antiparallel. Now there is a tendency to parallelism in the variation of flare activity in the north and south. On the basis of the difference in the monthly fluctuations of spot and flare activity it is concluded that the sources of these fluctuations are situated at different levels in the atmosphere. In 1964 A. Ol' established a close correlation between the height of the maximum of the 11-year cycle and activity at the end of the preceding cycle. The nature of this relationship has remained a mystery. Specialists at the Ussuriysk station feel that the basis for this is meridional movements of activity disturbances moving in the direction from the equator to the poles. These observed movements have the nature of wave movements and have been designated "polar waves." They are propagated from the solar equator of rotation to the poles with a velocity of 6 degrees annually. The polar waves are observed in all phases of the 11-year cycles and develop independently of them. Near the minimum the polar wave, beginning against a background of the old 11-year cycle, then continues amidst the phenomena of the new cycle. The polar waves are associated with movements of matter in the deep subphotospheric layers. In the layers of the solar atmosphere closer to the surface the centers of gravity of active phenomena move in an equatorward direction. Twenty years ago the concept prevailed that the matter in the innermost reaches of the sun is immobile. Now more and more facts have been accumulated indicating an instability of the inner layers of the sun. A new direction has developed--solar seismology--concerned with study of the internal structure of the sun on the basis of observations of fluctuations and wave movements at its surface.
[45-5303]

UDC 550.388.2

PREDICTING DEVELOPMENT OF IONOSPHERIC DISTURBANCE

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 21, No 5, Sep-Oct 81
(manuscript received 20 Jan 81) pp 948-949

KULESHOVA, V. P., LAVROVA, Ye. V. and LYAKHOVA, L. N., Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation, USSR Academy of Sciences

[Abstract] An investigation of δf_0F2 changes during different types of ionospheric disturbances led to the discrimination of mean D_{st} and SD variations, a result of which was formulation of a model of these variations for the eastern zone, represented in the form of maps and in analytical form (T. V. Gayvoronskiy, et al., GEOMAGNETIZM I AERONOMIYA, 18, 1106, 1978; V. P. Kuleshova, et al., GEOMAGNETIZM I AERONOMIYA, 20, 749, 1980). The latter article demonstrated the possibility of employing this representation in predicting the mean δf_0F2 variations during the time of magnetic disturbances. All this related to the eastern part of the northern hemisphere. For use of the proposed method at a global scale it is necessary to investigate its applicability for the western zone and the southern hemisphere. For this purpose maps of D_{st} and SD variations were constructed on the basis of data for stations in the western chain of stations for these same types of ionospheric storms and with the use of the same ionospheric-magnetic disturbances for 1956-1974, as was done in the first of the studies cited above. The resulting maps revealed an almost total correspondence of D_{st} and SD variations in the western and eastern zones. Accordingly, it is possible to combine the maps for the two zones and construct composite maps for the entire northern hemisphere. The standard deviation of the predicted δf_0F2 values from the actual values are: for Boulder 12%, Sverdlovsk 8%, Akita 13%. They do not differ substantially from the deviations when using its own map for each zone. Therefore, the composite maps, as well as the coefficients of the analytical representations obtained for them can be recommended for practical use in the prediction of δf_0F2 variations during the time of ionospheric disturbances of the corresponding type in the entire northern hemisphere, independently of longitude, An evaluation of the composite maps of D_{st} and SD variations for the northern hemisphere was made to ascertain their applicability in obtaining the δf_0F2 variations in the southern hemisphere. It was found that for evaluating the nature of development of ionospheric disturbance in the southern hemisphere it is possible to use regular δf_0F2 variations obtained for the corresponding geomagnetic latitude and the same season for the northern hemisphere. Figures 2; references 3 Russian.

[36-5303]

UDC 550.388.2

MECHANISM OF REFLECTED SIGNAL FREQUENCY SHIFT IN INITIAL STAGE OF IONOSPHERIC DISTURBANCE INDUCED BY POWERFUL RADIO WAVE

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 21, No 5, Sep-Oct 81 (manuscript received 9 Feb 81) pp 803-808

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[Abstract] In experiments with the modification of the ionospheric F layer by powerful radio radiation there is an asymmetric broadening of the spectrum of the reflected radio signal with a prevailing shift into the region of low frequencies. The most significant spectral broadening is observed in the initial modification stage. It is nautral to assume that this result is related to the appearance of essentially nonstationary plasma in the neighborhood of the level of reflection of the powerful radio wave. In this article the phenomenon is interpreted in the following way. In the initial satge of ionospheric heating by a powerful radio wave there is expulsion of plasma along the magnetic field from the region of maximum heating, as a result of which the plasma concentration profile becomes nonstationary. The conditions for radio wave propagation change with time, as is manifested in a frequency shift of the reflected wave. Since the frequency shift is dependent on time, averaging in an interval great in comparison with the characteristic time of change in the frequency shift gives a broadening of the spectrum of the radio signal reflected from the disturbed region of the ionosphere. Figures 2; references 8 Russian.
[36-5303]

UDC 550.388.2

MACROSCALE PLASMA STRATIFICATION ACCOMPANYING IONOSPHERIC DISTURBANCE BY POWERFUL RADIO WAVE

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 21, No 5, Sep-Oct 81 (manuscript received 17 Feb 81) pp 809-815

VAS'KOV, V. V., GUREVICH, A. V. and DIMANT, Ya. S., Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation, USSR Academy of Sciences, and Physics Institute imeni P. N. Lebedev, USSR Academy of Sciences

[Abstract] A study was made of the features of development of thermal self-focused instability of a powerful radio wave in the ionosphere in the presence of intensive local heating of plasma in the region of wave reflection from the ionospheric F layer. The following problem is solved. It is assumed that a powerful electromagnetic HF wave with ordinary polarization is incident normally

on a horizontally homogeneous ionosphere. It is assumed that in a narrow layer in the neighborhood of the reflection plane, also called the absorbing plane, there is dissipation of a considerable part of the energy of the incident wave, which results in heating of the electrons and local expulsion of plasma from the heated region. As a result of disturbance of the plasma concentration there is a change in the dispersion properties of the propagation medium for the incident radio wave, which in the presence of "small" large-scale initial inhomogeneities in the plasma (that is, greater than the length of the incident wave) leads to the development of thermal self-focused instability. The thickness of the absorbing layer is assumed to be small in comparison with the characteristic self-focused scale so that the self-focused wave can be neglected in the absorbing layer itself. Since in the undisturbed ionosphere the absorption of the high-frequency wave is small, whereas anomalous absorption can be considerable, ordinary Joule heating can be neglected. As a result of the thermal conductivity and diffusion the region is more extended vertically than the absorbing layer, but it is localized for the most part in the neighborhood of the reflection level. The investigation presented here is limited to the linear stage in development of the self-focused instability, assuming the heating of electrons in the absorbing layer to be constant in time. The problem was examined in a similar formulation in an article by V. V. Vas'kov, et al. in IZV. VUZOV: RADIOFIZIKA, 18, 1261, 1975, but now in a more correct form, in particular, with allowance for the inertia of ions. The latter leads to an ionosonic character of the process. The material presented here clearly reveals that the presence of intensive local heating of plasma caused by some mechanism of anomalous absorption of the energy of an incident ordinary radio wave in the region of its reflection from the ionospheric F layer leads to the rapid development of thermal self-focused instability. The stratification of plasma with a scale up to several kilometers has the nature of ionic sound and develops in fractions of a second, that is, substantially more rapidly than the characteristic times of heating of ionospheric plasma by the field of a powerful radio wave. Figures 2; references 9 Russian.
[36-5303]

UDC 550.388.2

ELECTROMAGNETIC DISTURBANCES IN MIDDLE-LATITUDE IONOSPHERE

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 21, No 5, Sep-Oct 81
(manuscript received 14 Dec 79) pp 833-840

BEREZIN, Yu. M., OSIPOV, N. K. and YAKHIMOVICH, S. I., Krasnoyarsk State University and Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation, USSR Academy of Sciences

[Abstract] The problem of determining the velocity field of magnetospheric convection on the basis of the equivalent stream function is solved for a simple model of integral conductivity of the ionosphere with its anisotropy

taken into account. In addition, a study is made of the influence of convective transfer developing during the time of magnetic storms and substorms in the middle latitudes on the structure of the ionosphere. As an example, the influence of SD variation on the middle-latitude ionosphere is investigated. This is illustrated in a series of diagrams. Figure 1 shows the equivalent current systems. During the first two days there are convective transfers, making it possible to use a stationary approximation for studying the effects of convection. Figure 2 shows the results of numerical computations with stipulation of the geomagnetic field in the form of the sum of spherical harmonics to n = 8 for constant Hall and Pedersen conductivities; this illustrates the distribution of disturbances of electron concentration δN_e at the ionospheric levels 250, 300 and 400 km. In this convection model the maximum disturbances are observed in the high and middle latitudes where there are longitudinal components of the equivalent, and this means, the convective current. The influence of the conductivity model on the structure of the field of disturbances of electron concentration is illustrated in Fig. 3, which gives the results of computations for a dipole geomagnetic field, an altitude of 250 km and two extreme cases of stipulation of conductivities. This figure shows that an anisotropy of conductivity substantially changes the structure of the field of disturbances in the middle latitudes and that it is impossible to neglect it in computations of real structures. Figure 4 shows that the results of computations of δN_e with specific Hall-Pedersen conductivities and a geomagnetic field represented by the sum of harmonics can lead to a latitudinal asymmetry of the investigated variations, although this asymmetry is not very great. The example cited here shows how computations can be made for determining the global distribution of variations of electron concentration at different ionospheric levels with allowance for the influence of anisotrppy of ionospheric conductivity and the structure of the main geomagnetic field. Figures 4; references 8: 5 Russian, 3 Western.
[36-5303]

UDC 550.388.2

MOVING DISTURBANCES (STRATIFICATIONS) IN IONOSPHERIC E REGION

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 21, No 5, Sep-Oct 81
(manuscript received 17 Apr 80) pp 936-939

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[Abstract] On E-layer ionograms for the middle latitudes there are often bends which as time elapses move downward, but sometimes upward. They are interpreted as moving disturbances (stratifications). In the investigation of such formations it is customary to use data from vertical sounding obtained using ordinary ionosondes. However, some features of the fine structure of the E region are not registered due to the inadequate accuracy in the reading of altitudes and improvement in ionosonde resolution make it possible to register

reflected signals from the ionosphere with maximum possible retention of form and spectrum. The use of such an ionosonde yielded additional information on moving disturbances (MD). MD in the E region differ somewhat from MD in the F region. The quasiperiodicity of MD in the E region is more difficult to detect due to the superposing of several MD. The quasiperiod of MD is about 20-30 minutes. The apparent vertical velocity of MD is 5-15 m/sec, that is, considerably less than in the F region, where the vertical velocity is 100-300 m/sec. The true velocity of movement, obtained from computations of the N(h) profile, is 1-2 m/sec. MD in the E region are observed regularly during the daytime at the minimum and maximum of solar activity. Using data from 15-minute observations it is not always possible to trace the development of MD, but it is possible to evaluate the probability of their appearance. The article gives the specific example of the diurnal variation in the number of cases of observation of MD in June 1965, 1966 and 1973 on the basis of data from 15-minute observations at Moscow. It was found that the formations appear and disappear in different years at one and the same time. In summer, and also at the equinox of 1965, 1966 and 1973 the minimum is observed at midday and the maximum in the morning and evening hours. Such a diurnal variation of MD during the summer months has a similarity to the diurnal variation of the system of neutral winds according to observations of meteor trails. A comparison was made of the diurnal variation of MD and winds. During the summer and equinoctial months the diurnal variations of the number of MD and the mean wind velocity were similar. It can be postulated that the system of neutral winds creates conditions for the development of MD. It appears that the appearance of MD is dependent on solar zenith angle. It can be assumed further that the reason for the appearance of MD in the E region should be sought in the processes of electron redistribution within the region itself. Figures 3; references 13: 10 Russian, 3 Western.
[36-5303]

UDC 550.35:550.388.2

WINTER POLAR IONOSPHERE DURING PERIODS OF MODERATE MAGNETIC ACTIVITY (MATHEMATICAL MODEL)

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 21, No 5, Sep-Oct 81 (manuscript received 16 Jun 80) pp 942-944

OSIPOV, N. K., Krasnoyarsk State University

[Abstract] This article gives the results of numerical modeling of the three-dimensional structure of the polar ionosphere for moderate magnetic activity ($K_p = 3$), winter ($\delta_{\odot} = -18°$) and the solar activity minimum ($F_{10.7} = 70\ W \cdot m^{-2} \cdot Hz^{-1}$). The rather simple model outlined by the author made it possible to construct a series of six diagrams illustrating the behavior of the polar ionosphere during winter under the described magnetic activity conditions. It is shown that at altitudes 200, 250 km in the global structure of the ionosphere it is easy to see the influence of three factors forming this structure: a) isolines of concentration "parallel" to the morning-evening line

in the sector of midday hours at latitudes 60-70° correspond to the structure of the Chapman function; b) focal maxima of the concentration at latitudes 75-78° with closed systems of isolines in the evening and morning sectors formed by ion formation by auroral electrons; c) appearance of the main ionospheric gap in the midday-evening and morning-midday sectors, as well as the polar cavity in the morning and evening sectors at latitudes 80-90° as a result of convective transfer. At great altitudes ($h \geqslant 300$ km) the consequences of leakage of particles virtually disappear; the transfer of ionospheric plasma due to the earth's rotation begins to be expressed more strongly even in the illuminated part of the ionosphere, with an increase in the slope of the concentration isolines to the morning-evening line in the midday sector; the results of convective transfer of plasma are traced clearly, with the appearance of an ionization tongue; the gap and polar cavity become more sharply expressed. At the same time the Svaalgard-Mansurov effect is detected in the structure of the ionosphere: due to the influence of the polar vortex the ionization tongue is deflected to the left of the midday-midnight line and the ionization cavity is displaced to the right along the morning-evening line. These structural forms are seen with the greatest contrast at the altitude of the maximum concentration in the ionosphere. With an increase in altitude the contrast of structural formations decreases, the electron concentration gradients decrease and the dimensions of the structural formations increase. However, the convective structure of ionospheric plasma described above persists to 450 km and possibly higher. The results of this modeling indicate that the real three-dimensional structure of the ionosphere contains information both on the structure of the electric field in the magnetosphere (convection of cold plasma) and on the regimes of pitch-angle diffusion of particles of the plasma layer and the daytime cusp (effects of leakage of auroral particles). Figures 1; references 1 Russian.
[36-5303]

ARCTIC AND ANTARCTIC RESEARCH

BRIEFS

JAPANESE-SOVIET ANTARCTIC COOPERATION--Japanese scientists expressed their gratitude to the Soviet polar workers for the hospitality, reliable communications and weather forecasts over eastern Antarctica. They made an air visit from the "Seva" station to the "Molodezhnaya" observatory. The leader of the 26th Soviet Antarctic Expedition, V. A. Shamont'yev, as reported by LenTASS, radioed about this. Scientists from both countries made monitoring checks of the parameters of the geophysical apparatuses and agreed on cooperating during the investigative season of the south polar summer. In particular, joint geological trips and an air magnetic survey are planned. [Excerpts] [Leningrad LENINGRADSKAYA PRAVDA in Russian 21 Oct 81 p 2]

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